

REMARKS

The Examiner has objected to the Specification as failing to provide proper antecedent basis for the claimed subject matter. More specifically, the Examiner has argued that “[r]egarding claims 16 and 17, ‘computer readable medium’ does not have proper antecedent basis” and that “[n]o support was found in the specification for ‘computer readable medium.’”

Applicant respectfully disagrees and directs the Examiner’s attention to Page 5, line 27 of the specification, which discloses “a memory,” which is clearly a computer readable medium. As a result, proper antecedent basis exists for the claimed subject matter. Of course, the above citation is merely an example of the above claim language and should not be construed as limiting in any manner.

Additionally, the Examiner has rejected Claims 1-3, 5-15, and 18-19 under 35 U.S.C. 101 as being directed to non-statutory subject matter. More specifically, the Examiner has stated that “[t]he instant claims neither transform underlying subject matter nor positively tie to another statutory category that accomplishes the claimed method steps, and therefore do not qualify as a statutory process.”

Applicant respectfully disagrees. The subject matter that courts have found to be outside of, or exceptions to, such four statutory categories of invention is limited to abstract ideas, laws of nature and natural phenomena. In the present case, the claims at issue clearly do not fall into such categories. Further, even if the Examiner were to attempt to argue that the claims at issue did allegedly fall into such categories, applicant asserts that the claims are clearly directed to a practical application thereof.

In the present case, applicant teaches and claims “performing an operation on pixel data” (see Claims 1 and 5 – emphasis added). By virtue of the claimed “performing,” applicant clearly teaches and claims a “transformation” of an article or physical object to a different state or thing. Further, applicant claims “modifying a value (x) based on an algorithm” (see Claims 1 and 5 – emphasis added). Such specifically

claimed substantial limitation also clearly teaches and claims a "transformation" of an article or physical object to a different state or thing.

For these and various other reasons, applicant respectfully contends that the claims at issue clearly meet the requirements of 35 U.S.C. 101.

The Examiner has rejected Claims 1-3, 5-6, 8, 16, and 17 under 35 U.S.C. 103(a) as being unpatentable over Aleksic (U.S. Patent No. 6,175,368), in view of Cosman (U.S. Patent No. 6,525,740), and further in view of Salomon ("Computer Graphics and Geometric Modeling"). Applicant respectfully disagrees with such rejection.

With respect to independent Claims 1, 16, and 17, the Examiner has relied on Col. 3, lines 4-6 from Aleksic, in addition to Col. 1, lines 55-57 and Col. 6, lines 15-50 from Cosman, to make a prior art showing of applicant's claimed technique "wherein the modifying is based on a depth-component of the algorithm."

Specifically, the Examiner has argued that "Aleksic... teaches modifying is based on the normal shading component." In addition, the Examiner has argued that "Cosman teaches [calculating] angular tilts U and V from the values in [a] height map and stored in bump angle memory," that "the angular tilt of the bump map is considered...equivalent to the normal vector as both the angular tilt and the normal vector represents the curvature of the bump map," and that "[the] height map is the functional equivalent of a depth map." The Examiner has further argued that "therefore, Cosman teaches [deriving] the normal vector from the depth map (depth component)," that "Aleksic already teaches that modifying is based on the normal vector," and that "[the] values of [the] height map correspond[d] to the depth value."

Applicant respectfully disagrees and notes that the above excerpts relied on by the Examiner merely teach that "[t]he bump-shading component ($\Delta N \cdot L$) is then combined with the normal shading component ($N \cdot L$) to produce the shading function for the given pixel" (Aleksic, Col. 3, lines 4-6). The excerpts further teach that "[t]o create the illusion

of bumps, a bump texture map contains values for each texel, that define the local "tip" or "tilt" which is applied to the instantaneous surface normal' (Cosman, Col, 1, lines 55-57).

Additionally, the excerpts teach that "the bump curvature values are related to the largest absolute difference in the tilt values of the surrounding texels which in turn is related to the absolute height values of the bump map," and that "the angular tilts U and V are calculated by the angle processor 42 from the values in the height map 40 and stored in bump angle memory 44" (Cosman, Col, 6, lines 23-38).

Thus, as noted above, Aleksic only discloses that the bump-shading component ($\Delta N \cdot L$) is combined with the normal shading component ($N \cdot L$), which does not suggest that the normal shading component of Aleksic is the same as the angular tilts of Cosman, as suggested by the Examiner. Thus, merely disclosing that angular tilts are calculated by the angle processor from the values in the height map, in addition to disclosing that a bump-shading component is combined with a normal shading component to produce a shading function for a given pixel, fails to teach a technique "wherein the modifying is based on a depth-component of the algorithm" (emphasis added), as claimed.

In the Office Action dated 04/08/2008, the Examiner has merely reiterated their previous arguments and has further argued that "Aleksic teaches modifying a value (x) (N summed with ΔN produces a resulting vector $N + \Delta N$, which is perpendicular to the bumped surface) based on an algorithm (addition corresponds to algorithm)," and has further argued that "modifying is based on the normal shading component [as shown in] col. 1, lines 52-57, col. 3 lines 4-6... col. 4 lines 1-35, col. 6 lines 25-32, col. 10 lines 2-19." Further still, the Examiner has argued that "it should be noted that [a] normal shading component is a product of a normal vector of a[n] object and a light vector" and that "when vector $N + \Delta N$ is multiplied with the light vector L, it results in the desired shading function for this... particular pixel location and thus determine[s] bump mapping pixel-by-pixel" in addition to arguing that "the display value of a pixel is thus determined using the bump-shading component and a normal shading component, which includes a normal vector."

Applicant respectfully disagrees and notes that the above excerpts from Aleksic relied on by the Examiner merely disclose that “[t]he bumping process... begins by determining a normal vector (N) of the object, where the normal vector is perpendicular to the planer surface of the object” (Col. 1, lines 53-57 – emphasis added). Additionally, the excerpts teach that “[t]he bump-shading component ($\Delta N \cdot L$) is... combined with the normal shading component ($N \cdot L$) to produce the shading function for the given pixel” (Col. 3, lines 4-6 – emphasis added). Further, the excerpts disclose that “[t]he combining circuit 30 receives the color information 46, the texel information 48 and the bump intensity value 44,” that “the combining circuit 30 receives a normal shading function ($N \cdot L$) and combines the normal shading function with the bump intensity value 44 to obtain a resulting shading function ($N \cdot L + \Delta N \cdot L$),” and that “[t]he combining circuit 30 then combines the resulting shading function with the color information 46, and the texel information 48 to produce display data 50 for a given pixel” (Col. 4, lines 22-30 – emphasis added).

Further still, the excerpts disclose that “[t]he first computing module 121 receives a light vector L, which represents the vector of at least one light source relating to the graphical images to be displayed” as well as “an object vector N, which represents the normal vector of the object being rendered,” and that “[t]he first computing module 121 combines the vectors to produce a normal shading function 156 ($N \cdot L$)” (Col. 6, lines 25-32 – emphasis added). Also, the excerpts teach that “the normalized vector N of the object is summed with the ΔN vector of the bump surface to produce the resulting vector $N + \Delta N$,” that “[t]he resulting vector is perpendicular to the bumped surface,” and that “[b]y performing a dot product with the light vector L and the resulting vector $N + \Delta N$ produces the desired shadowing function for this particular pixel location” (Col. 10, lines 10-15).

However, merely determining a normal vector for an object, combining a bump-shading component with a normal shading component to produce a shading function for a given pixel, combining a shading function with a bump intensity value to obtain a

resulting shading function, combining light and object vectors to produce a normal shading function, and summing a normalized vector with a ΔN vector of the bump surface to produce a resulting vector, as in Aleksic, does not suggest that the normal shading component of Aleksic is the same as the angular tilts of Cosman, as suggested by the Examiner. Therefore, the above excerpt language, in addition to calculating angular tilts by an angle processor from the values in the height map, as in Cosman, fails to teach a technique “wherein the modifying is based on a depth-component of the algorithm” (emphasis added), as claimed by applicant.

In the Advisory Action mailed 06/27/2008, the Examiner has simply repeated the same arguments presented in the Office Action mailed 04/08/2008. The Examiner has also argued that “it is known to one of ordinary skill in the art that a normal vector of a bump map represents it’s curvature” and has further argued that “the angular [tilt] values U and V as taught by Cosman are used to calculate the bump curvature values.”

Applicant respectfully disagrees. Applicant respectfully asserts that the normal vector disclosed in the excerpts from Aleksic relied on by the Examiner only relates to “a normal vector (N) of the object, where the normal vector is perpendicular to the planar surface of the object” (Aleksic-Col. 1, lines 55-57 - emphasis added). Clearly, a normal vector of an object does not render obvious in Aleksic that “a normal vector of a bump map represents it’s curvature” (emphasis added), as suggested by the Examiner, especially since in Aleksic “[t]he bump map coordinates relate the object to a bump map” (Aleksic-Col. 1, lines 48-50 - emphasis added).

Thus, in response to the Examiner’s apparent reliance on Official Notice, applicant again points out the remarks above that clearly show the manner in which some of applicant’s claims further distinguish the prior art relied on by the Examiner. Applicant thus formally requests a specific showing of the subject matter in ALL of the claims in any future action. Note excerpt from MPEP below.

“If the applicant traverses such an [Official Notice] assertion the examiner should cite a reference in support of his or her position.” See MPEP 2144.03.

Nevertheless, even assuming *arguendo* that “it is known to one of ordinary skill in the art that a normal vector of a bump map represents it’s curvature” and that “the angular [tilt] values U and V as taught by Cosman are used to calculate the bump curvature values,” as noted by the Examiner, such still does not meet applicant’s claimed technique “wherein the modifying is based on a depth-component of the algorithm” (emphasis added), as claimed by applicant.

In the Office Action mailed 10/01/2008, the Examiner has simply repeated the same arguments presented in the Office Action mailed 04/08/2008 and the Advisory Action mailed 06/27/2008. Applicant respectfully disagrees with such arguments for the reasons noted above. The Examiner has also argued that “the Cosman reference deals with a three-dimensional image (see col. 4 lines 34-36)” that “the texel tilt values are generated using a height map (col. 6 lines 40-41),” and that “lines 30-33 of Cosman teach bump U and V values, and further teaches that each of the curvature values are derived from the bump values at each associated MIP level of detail.” Additionally, the Examiner has argued that “bump U and V values are the same as bump values used to derive the curvature values” and that “[a]lthough Aleksic and Cosman... do not explicitly teach that the normal vector of a bump map depends on its curvature... Salomon teaches exactly the same (pg. 555; the derivatives of the unit normal vector depend on the curvature of the surface).”

Applicant respectfully disagrees and notes that the excerpts from Cosman relied on by the Examiner merely disclose “displaying a three-dimensional image with realistic specular highlights” (Col. 4, lines 35-36), in addition to disclosing that “the preferred method for generating the texel tilt values uses a height map” (Col. 6, lines 40-41 – emphasis added), that “[t]he curvature values comprise a bump map component which can be used with MIP maps and tri-linearly blended just like the bump U and V values,” and that “[e]ach of the curvature values are derived from the bump values at each

associated MIP level of detail” (Col. 6, lines 30-34). Further, the excerpt from Salomon relied on by the Examiner discloses that “the derivatives n_u and n_w of the unit normal depend on the curvature of the surface,” where “the normal is the cross-product [of the two partial derivatives of the surface]” and where “[i]f the surface is not highly curved, the magnitudes of those derivatives are small and they can be ignored” (Page 555, second and third paragraphs).

However, merely disclosing that texel tilt values are generated using a height map, and that curvature values are derived from bump values, as in Cosman, and further disclosing that derivatives of a unit normal depend on the curvature of the surface, where derivatives of a surface that is not highly curved can be ignored, as in Salomon, fails to disclose a technique “wherein the modifying is based on a depth-component of the algorithm” (emphasis added), as claimed by applicant. Merely generating texel tilt values using a height map and deriving curvature values from bump values, as in Cosman, in addition to disclosing that derivatives of a unit normal depend on surface curvature in that derivatives of a surface that is not highly curved can be ignored, as in Salomon, fail to disclose a technique “wherein the modifying is based on a depth-component of the algorithm” (emphasis added), as specifically claimed by applicant.

Additionally, the Examiner alleges that “the applicant argues ‘... the normal shading component of Aleksic is the same as the angular tilts of Cosman.’” Applicant respectfully disagrees and notes that the above assertion was made by the Examiner, not applicant. Additionally, applicant respectfully points out the above arguments which clearly demonstrate that the excerpts from Aleksic relied on by the Examiner do not suggest that the normal shading component of Aleksic is the same as the angular tilts of Cosman, as suggested by the Examiner.

Additionally, with respect to independent Claim 5, the Examiner has relied on Col. 3, lines 4-6 from Aleksic, in addition to Col. 1, lines 55-57 and Col. 6, lines 15-67, Col. 9, lines 6-15 and 35-67, and Col. 10, lines 1-54 from Cosman to make a prior art

showing of applicant's claimed technique "wherein the modifying allows a lighting operation to display an interaction of displayed objects."

Specifically, the Examiner has reiterated the above noted arguments in addition to arguing that the "wave bump map and ocean correspon[d] to displayed objects," and that "raising the brightness of the scene to overall average brightness to compensate for the brightness decrease in areas near the specular highlight corresponds to applying a lighting operation."

Applicant respectfully disagrees. As noted above, Col. 3, lines 4-6 in Aleksic, in addition to Col. 1, lines 55-57 and Col. 6, lines 15-67 in Cosman, merely disclose that angular tilts are calculated by the angle processor from the values in the height map, and that a bump-shading component is combined with a normal shading component to produce a shading function for a given pixel. Clearly, such excerpts do not even suggest that "the modifying allows a lighting operation to display an interaction of displayed objects" (emphasis added), as claimed.

Additionally, the above excerpts relied on by the Examiner merely teach that "[t]o compensate for the brightness decrease in areas near the specular highlight a complementary computation is needed to raise the brightness of the scene to an overall average brightness that is believable" (Cosman, Col. 9, lines 12-15). Further, the excerpts teach "a wave bump map on a simulated ocean" and that "[w]here the bumps exist, the modeler can tune the coefficients so that the average brightness of the ocean within the specular area is correct" (Col. 9, lines 53-56).

However, merely disclosing that a complementary computation is needed to raise the brightness of a scene to an overall average brightness, in addition to disclosing a wave bump map and tuning coefficients where the bumps exist, fails to even *suggest* a technique "wherein the modifying allows a lighting operation to display an interaction of displayed objects" (emphasis added), as claimed by applicant.

In the Office Action dated 04/08/2008, the Examiner has merely reiterated their previous arguments and has further argued that the “wave bump map on a simulated ocean corresponds to the interacti[on] of displayed objects” and that “it should be noted that the actual modification values stored within a polygon to increase the brightness of areas surrounding the highlight will depend on the nature of the bump map.”

Applicant respectfully disagrees and notes that Cosman merely discloses that “the actual modification values stored within a polygon to increase the brightness of areas surrounding the highlight will depend on the nature of the bump map” (Col. 9, lines 40-43). Further, Cosman discloses “a wave bump map on a simulated ocean” and that “[w]here the bumps exist, the modeler can tune the coefficients so that the average brightness of the ocean within the specular area is correct” (Col. 9, lines 53-56).

However, merely disclosing that a complementary computation is needed to raise the brightness of a scene to an overall average brightness, where modification values to increase the brightness of areas surrounding the highlight depend on the nature of the bump map, in addition to disclosing a wave bump map as well as the tuning of coefficients where the bumps exist, as in Cosman, fails to even *suggest* a technique “wherein the modifying allows a lighting operation to display an interaction of displayed objects” (emphasis added), in the context claimed by applicant.

In the Advisory Action mailed 06/27/2008, the Examiner has simply repeated the same arguments presented in the Office Action mailed 04/08/2008. The Examiner has also argued that “it is known to one of ordinary skill in the art that a normal vector of a bump map represents it’s curvature” and that “the angular [tilt] values U and V as taught by Cosman are used to calculate the bump curvature values.” Further, the Examiner has argued that the “wave bump map displayed on a simulated ocean generates an interaction between the displayed objects, wave bump map and the ocean, to cause an animation effect,” and that “when the brightness value of the scene is changed, it affects the lighting of the scene as displayed to a viewer.”

Applicant respectfully disagrees. For example, applicant respectfully disagrees with the Examiner's allegations that "it is known to one of ordinary skill in the art that a normal vector of a bump map represents it's curvature" and that "the angular [tilt] values U and V as taught by Cosman are used to calculate the bump curvature values" for at least the reasons noted above with respect to independent Claims 1, 16 and 17. Moreover, such allegations by the Examiner do not even suggest a technique "wherein the modifying allows a lighting operation to display an interaction of displayed objects" (emphasis added), in the context claimed by applicant.

Still yet, the excerpts from Cosman relied on by the Examiner simply do not disclose that a "wave bump map displayed on a simulated ocean generates an interaction between the displayed objects, wave bump map and the ocean," as suggested by the Examiner. For example, Col. 9, line 53-Col. 10, line 54 from Cosman which discloses the wave bump map merely teaches that "[w]here the bump exists, the modeler can tune the coefficients so that the average brightness of the ocean within the specular area is correct" (Col. 9, lines 53-56). Clearly, correcting an average brightness of the ocean fails to support the Examiner's argument that a "wave bump map displayed on a simulated ocean generates an interaction between the displayed objects, wave bump map and the ocean." Even so, a "wave bump map displayed on a simulated ocean [which] generates an interaction between the displayed objects, wave bump map and the ocean" does not rise to the level of specificity of applicant's claimed technique "wherein the modifying allows a lighting operation to display an interaction of displayed objects" (emphasis added), in the context claimed by applicant.

Additionally, simply noting that "when the brightness value of the scene is changed, it affects the lighting of the scene as displayed to a viewer" (emphasis added), as noted by the Examiner, fails to even suggest a technique "wherein the modifying allows a lighting operation to display an interaction of displayed objects" (emphasis added), as applicant claims.

In the Office Action mailed 10/01/2008, the Examiner has simply repeated the same arguments presented in the Office Action mailed 04/08/2008 and the Advisory Action mailed 06/27/2008. Applicant respectfully disagrees with such arguments for the reasons noted above. The Examiner has also argued that “the Cosman reference deals with a three-dimensional image (see col. 4 lines 34-36)” that “the texel tilt values are generated using a height map (col. 6 lines 40-41),” and that “lines 30-33 of Cosman teach bump U and V values, and further teaches that each of the curvature values are derived from the bump values at each associated MIP level of detail.” Additionally, the Examiner has argued that “bump U and V values are the same as bump values used to derive the curvature values” and that “[a]lthough Aleksic and Cosman... do not explicitly teach that the normal vector of a bump map depends on its curvature... Salomon teaches exactly the same (pg. 555; the derivatives of the unit normal vector depend on the curvature of the surface).”

Applicant respectfully disagrees and asserts that the Examiner’s arguments have not addresses applicant’s specific argument’s above. Thus, applicant again notes that Cosman merely discloses that texel tilt values are generated using a height map, and that curvature values are derived from bump values, and that Salomon discloses that derivatives of a unit normal depend on the curvature of the surface, where derivatives of a surface that is not highly curved can be ignored. However, merely generating texel tilt values using a height map and deriving curvature values from bump values, as in Cosman, in addition to disclosing that derivatives of a unit normal depend on surface curvature in that derivatives of a surface that is not highly curved can be ignored, as in Salomon, fail to even *suggest* a technique “wherein the modifying allows a lighting operation to display an interaction of displayed objects” (emphasis added), as claimed by applicant.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable

expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed.Cir.1991).

Applicant respectfully asserts that at least the third element of the *prima facie* case of obviousness has not been met, since the prior art references, as relied upon by the Examiner, fail to teach or suggest all of the claim limitations, as noted above. A notice of allowance or a proper prior art showing of all of applicant's claim limitations, in combination with the remaining claim elements, is respectfully requested.

Applicant further notes that the prior art is also deficient with respect to the dependent claims. With respect to Claims 14 and 15, the Examiner has rejected the same under 35 U.S.C. 103(a) as being unpatentable over Aleksic, in view of Cosman, in view of Salomon, in view of Demers et al. (U.S. Patent No. 6,700,586), and further in view of Jenkins (U.S. Patent No. 6,028,608). Specifically, the Examiner has relied on Col. 53, lines 56-67; and Col. 54, line 38 from the Jenkins reference to make a prior art showing of applicant's claimed techniques "wherein y equals three (3)" (see Claim 14) and "wherein y equals four (4)" (see Claim 15). Further, the Examiner has argued that "Jenkins teaches a case when [the] viewpoint motion vector is parallel to [the] view direction vector, object space x and y values are constant while [the] z value varies."

Applicant respectfully disagrees and notes that the above excerpts relied on by the Examiner merely teach a "case of viewpoint motion with a constant view direction vector" (Col. 53, lines 56-57) and a "transform [of] x and y object-space values" (Col. 54, lines 37-38). However, nowhere in the cited excerpts is a technique taught "wherein y equals three (3)" (see Claim 14) and "wherein y equals four (4)" (see Claim 15), especially where " X includes $(n \cdot T_{\text{proj}}[y])$ " and "where $T_{\text{proj}}[y]$ includes the projection transform" (see Claim 13), in the context claimed.

In the Office Action dated 04/08/2008, the Examiner has merely reiterated their previous arguments in addition to previous arguments concerning dependent Claims 12 and 13, and has further argued that “the dot product calculation between the normals and the matrix corresponds to $(n \cdot T_{proj}[y])$, which further implies that X includes the dot product calculation between the normals and the matrix” and that “it should be noted [that] although the reference does not use the same terminology as the claimed invention, the functional equivalents of the related terms [have] been suggested by the examiner.” Further, the Examiner has argued that “by $y = 3$ and $y = 4$, the examiner interprets [that] the value of y stays constant during the transformation process.”

Applicant respectfully disagrees and again notes that the above excerpts relied on by the Examiner merely teach a “case of viewpoint motion with a constant view direction vector” (Col. 53, lines 56-57) and a “transform [of] x and y object-space values” (Col. 54, lines 37-38). However, nowhere in the cited excerpts is a technique taught “wherein y equals three (3)” (see Claim 14) and “wherein y equals four (4)” (see Claim 15), especially where “X includes $(n \cdot T_{proj}[y])$ ” and “where $T_{proj}[y]$ includes the projection transform” (see Claim 13), in the context claimed.

In the Office Action mailed 10/01/2008, the Examiner has simply repeated the same arguments presented in the Office Action mailed 04/08/2008. Applicant respectfully disagrees with such arguments for the reasons noted above. The Examiner has also argued that “the language of the claims do[es] not suggest that [the] claimed invention cannot be a case of viewpoint motion with a constant view direction vector and a transform of x and y object-space values.”

Applicant respectfully disagrees. First, applicant again notes that applicant specifically claims a technique “wherein y equals three (3)” (see Claim 14) and “wherein y equals four (4)” (see Claim 15). Additionally, applicant again notes that the above excerpts relied on by the Examiner merely teach a “case of viewpoint motion with a constant view direction vector” (Col. 53, lines 56-57) and a “transform [of] x and y object-space values” (Col. 54, lines 37-38). However, nowhere in the cited excerpts is a

technique taught “wherein y equals three (3)” (see Claim 14) and “wherein y equals four (4)” (see Claim 15), especially where “ X includes $(n \bullet T_{\text{proj}}[y])$ ” and “where $T_{\text{proj}}[y]$ includes the projection transform” (see Claim 13), in the context claimed.

Again, since at least the third element of the *prima facie* case of obviousness has not been met, a notice of allowance or specific prior art showing of each of the foregoing claim elements, in combination with the remaining claimed features, is respectfully requested.

To this end, all of the independent claims are deemed allowable. Moreover, the remaining dependent claims are further deemed allowable, in view of their dependence on such independent claims.

In the event a telephone conversation would expedite the prosecution of this application, the Examiner may reach the undersigned at (408) 505-5100. The Commissioner is authorized to charge any additional fees or credit any overpayment to Deposit Account No. 50-1351 (Order No. NVIDP015A).

Respectfully submitted,
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